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(54) **DIATOMACEOUS EARTH FILTER APPARATUS AND METHOD**

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<b>B01D 37/02</b>	(2006.01)
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(57) **ABSTRACT**

The invention provides an apparatus and method for removing diatomaceous earth and contaminants from a filter and for filtering liquid using diatomaceous earth. Embodiments of the method can include a washdown process, a backwash process, and a filtering process. Some embodiments of the apparatus can include one or more filter cartridges with cartridge tubes to increase flow during the backwash process. Some embodiments of the apparatus can include a backwash sprayer to disturb contaminants during the backwash process. Some embodiments of the apparatus can include a removable lid to access the filter cartridges during the washdown process.

(58) **Field of Classification Search**

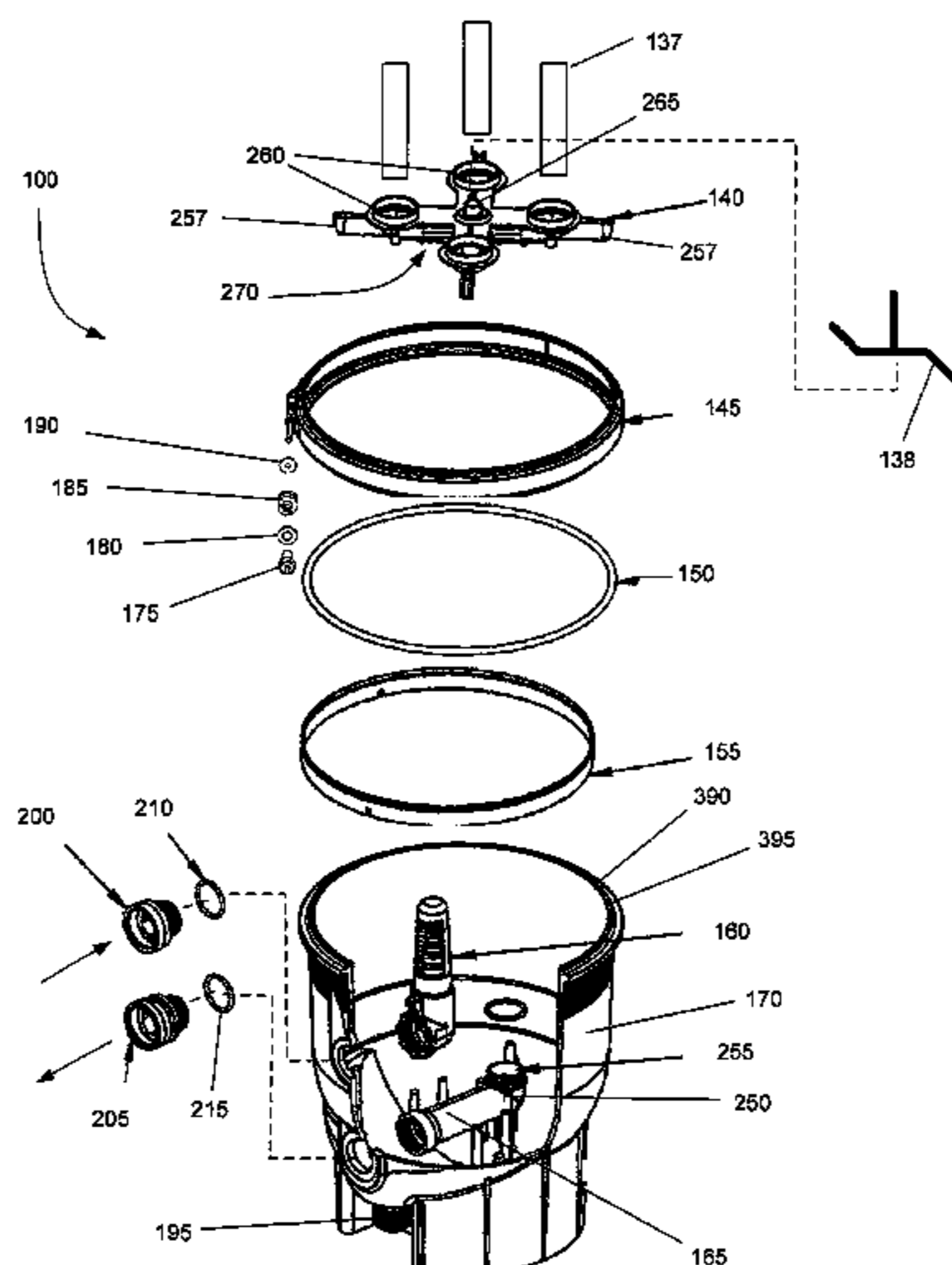
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See application file for complete search history.

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**4 Claims, 9 Drawing Sheets**



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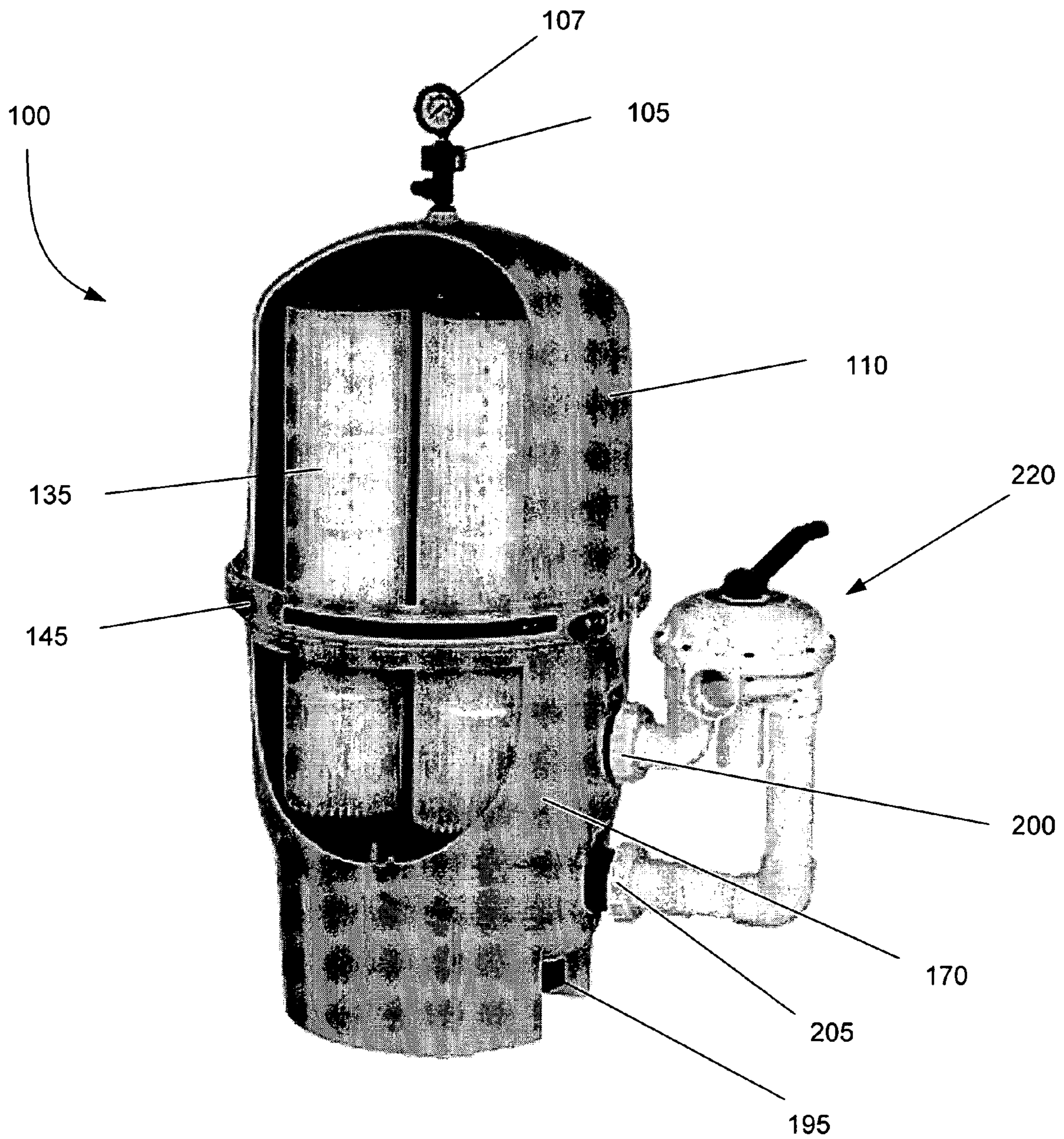


Fig. 1

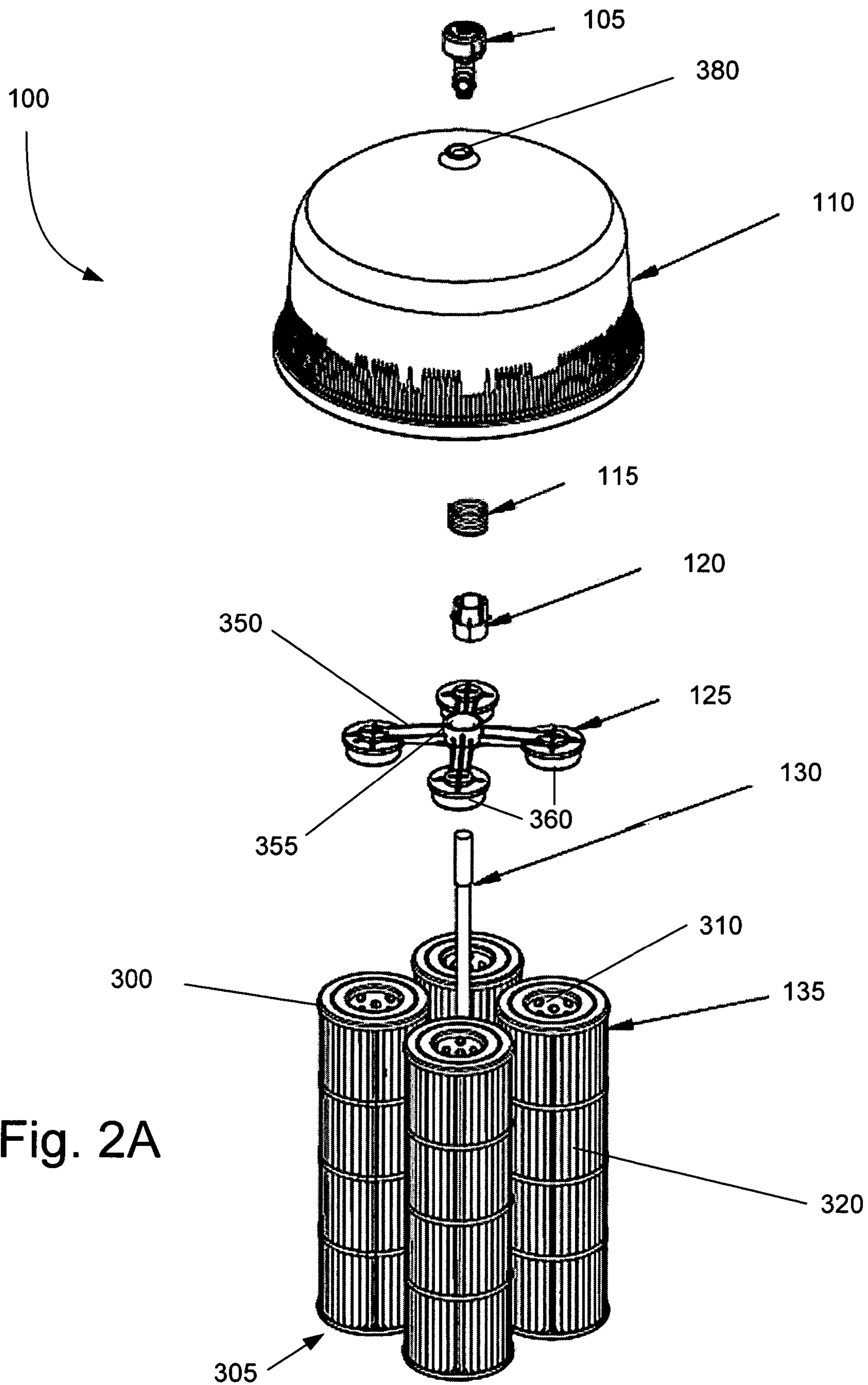
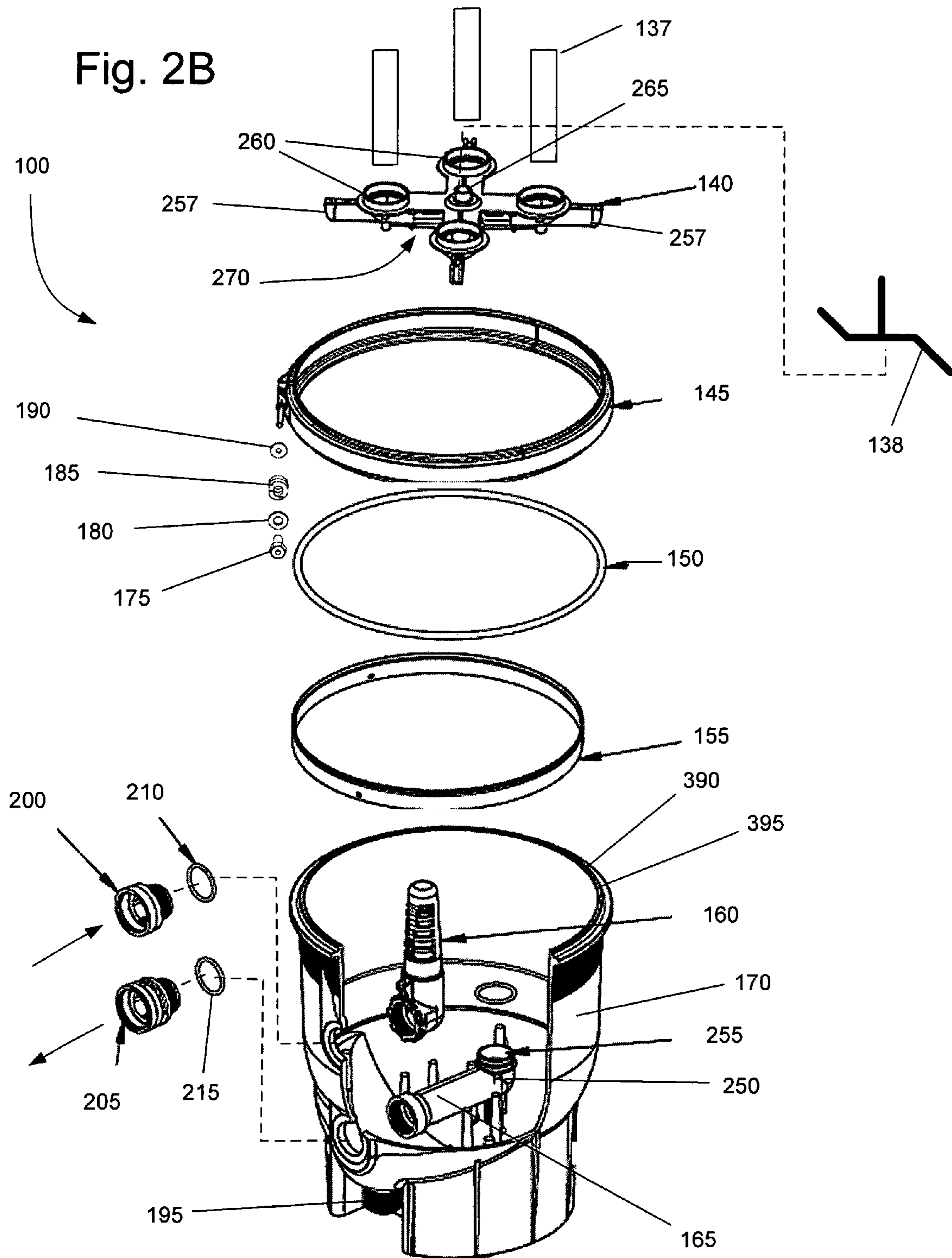


Fig. 2A



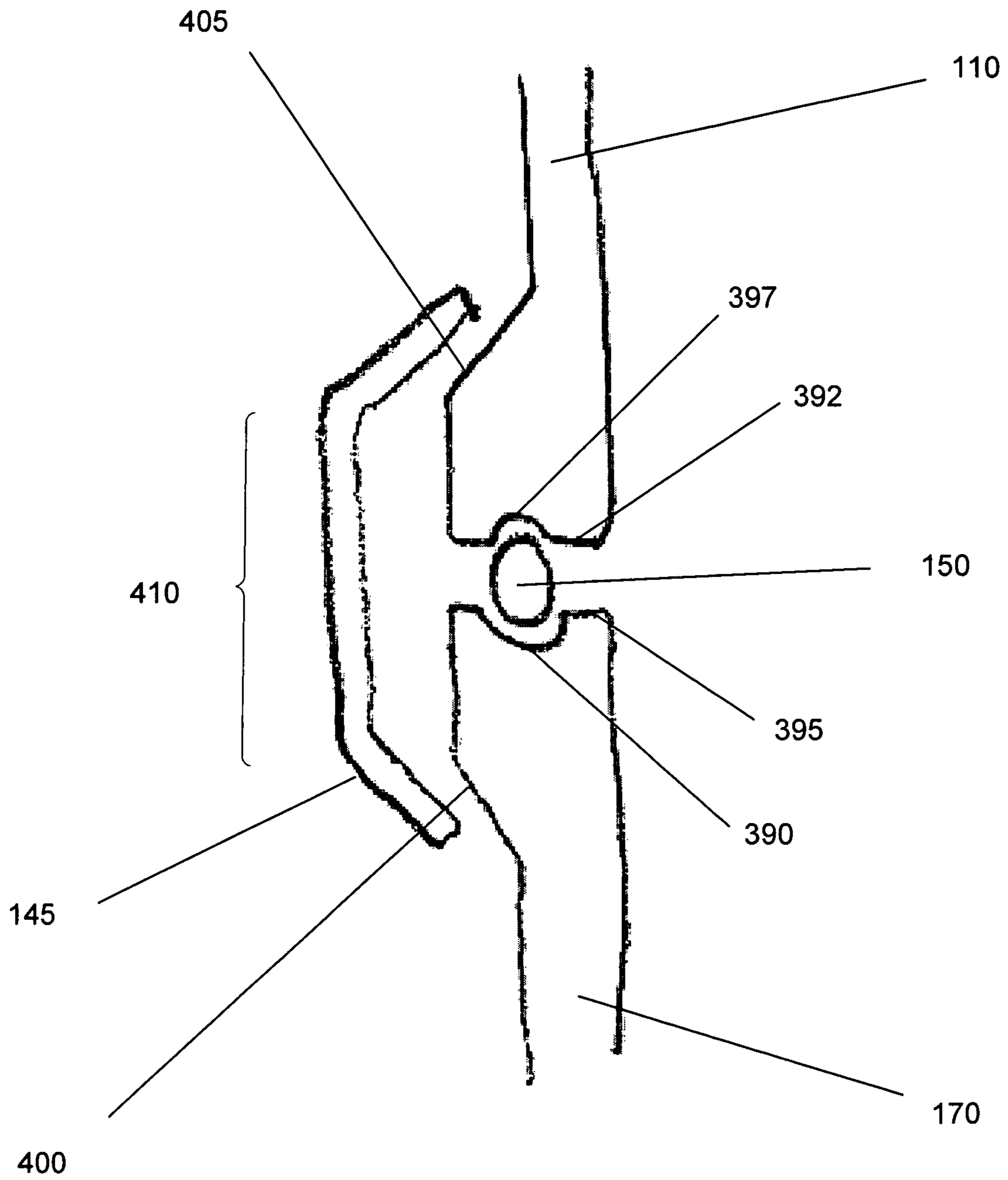


Fig. 3

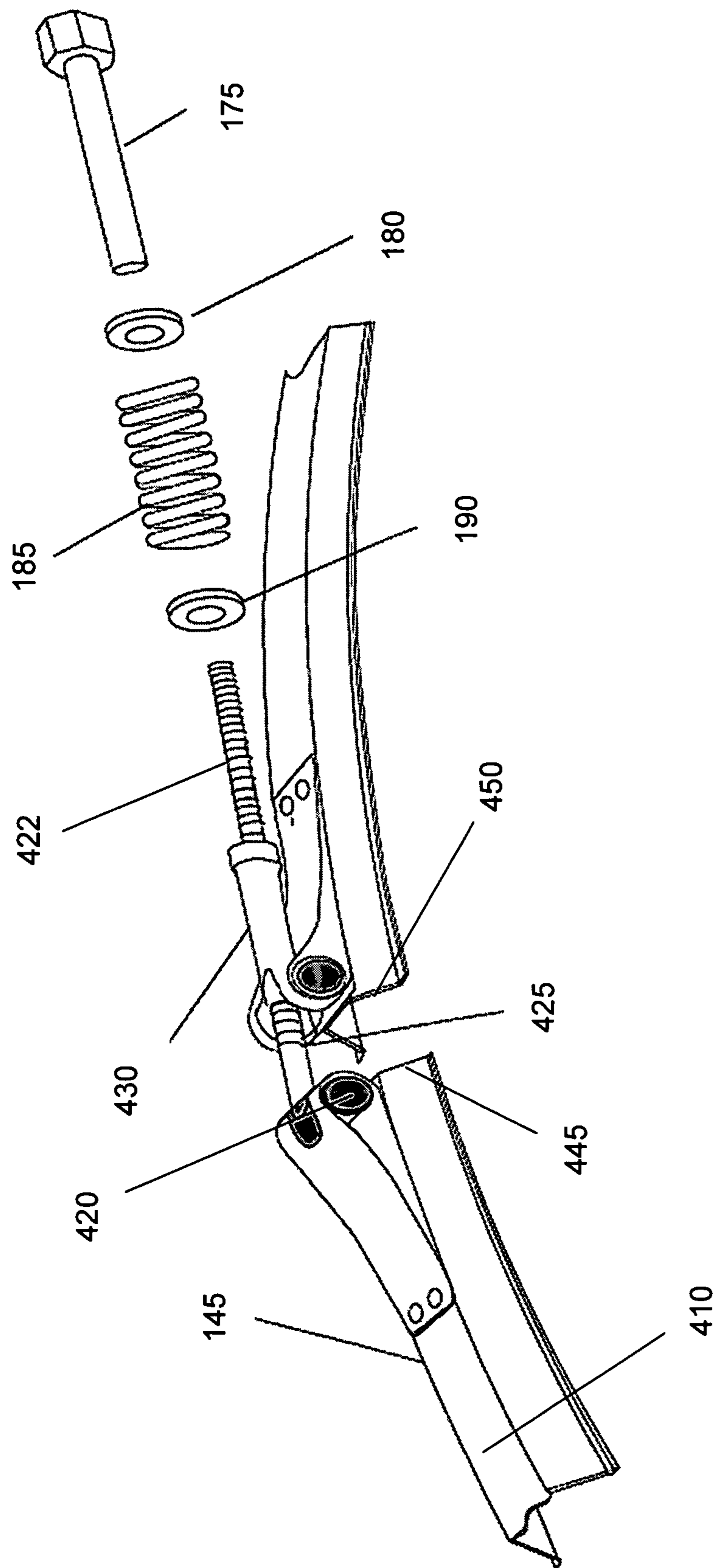


Fig. 4

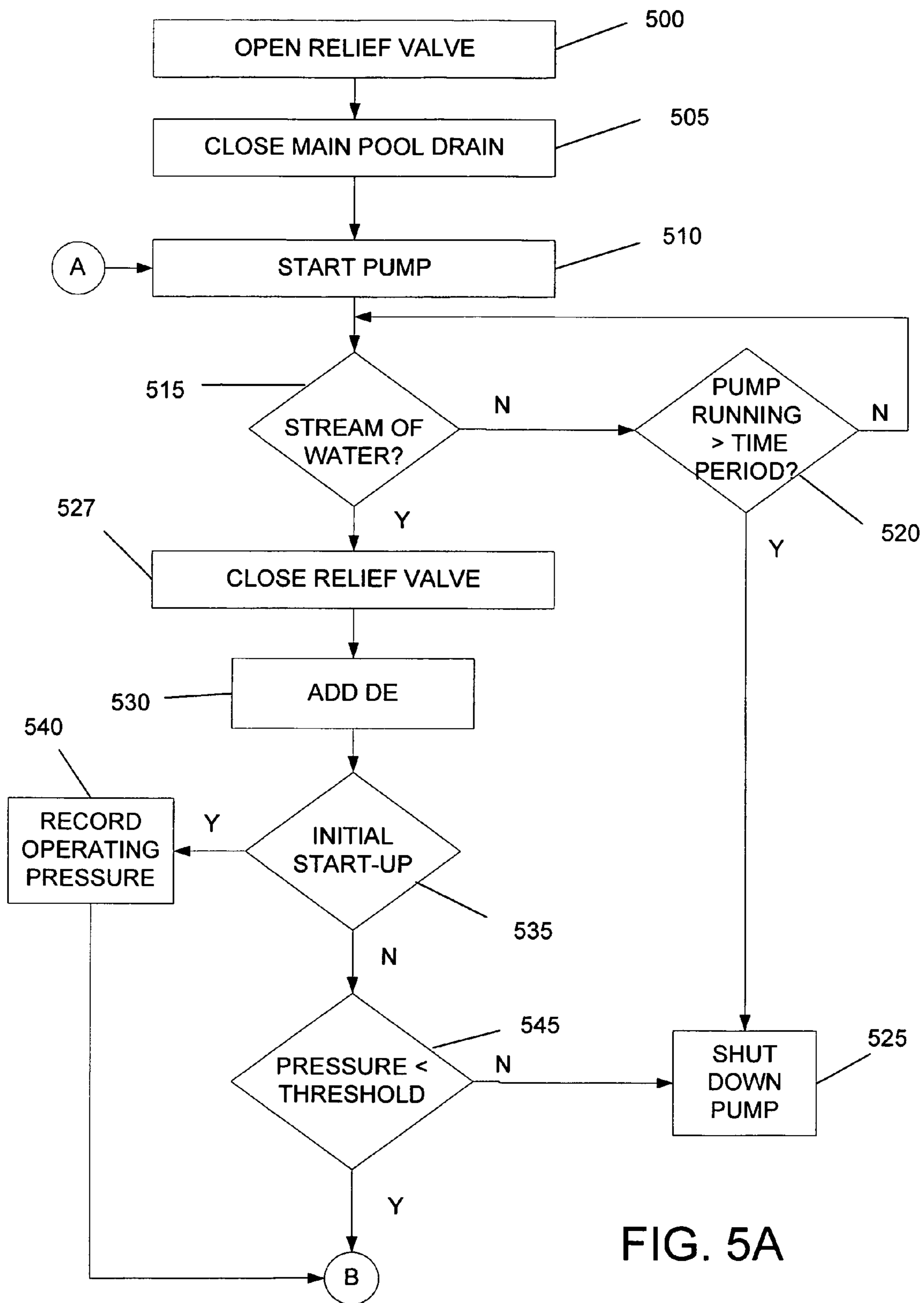


FIG. 5A



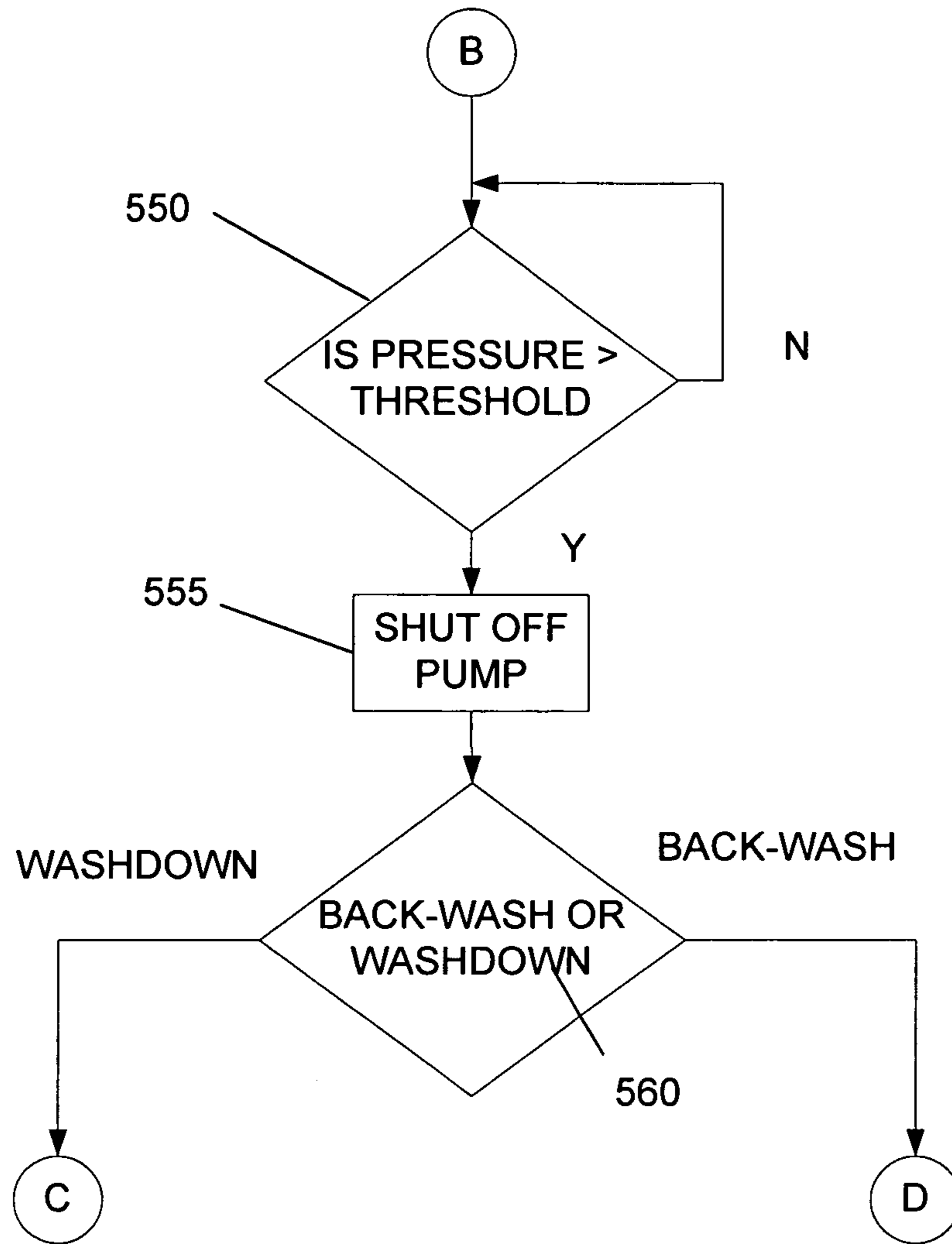


Fig. 5B

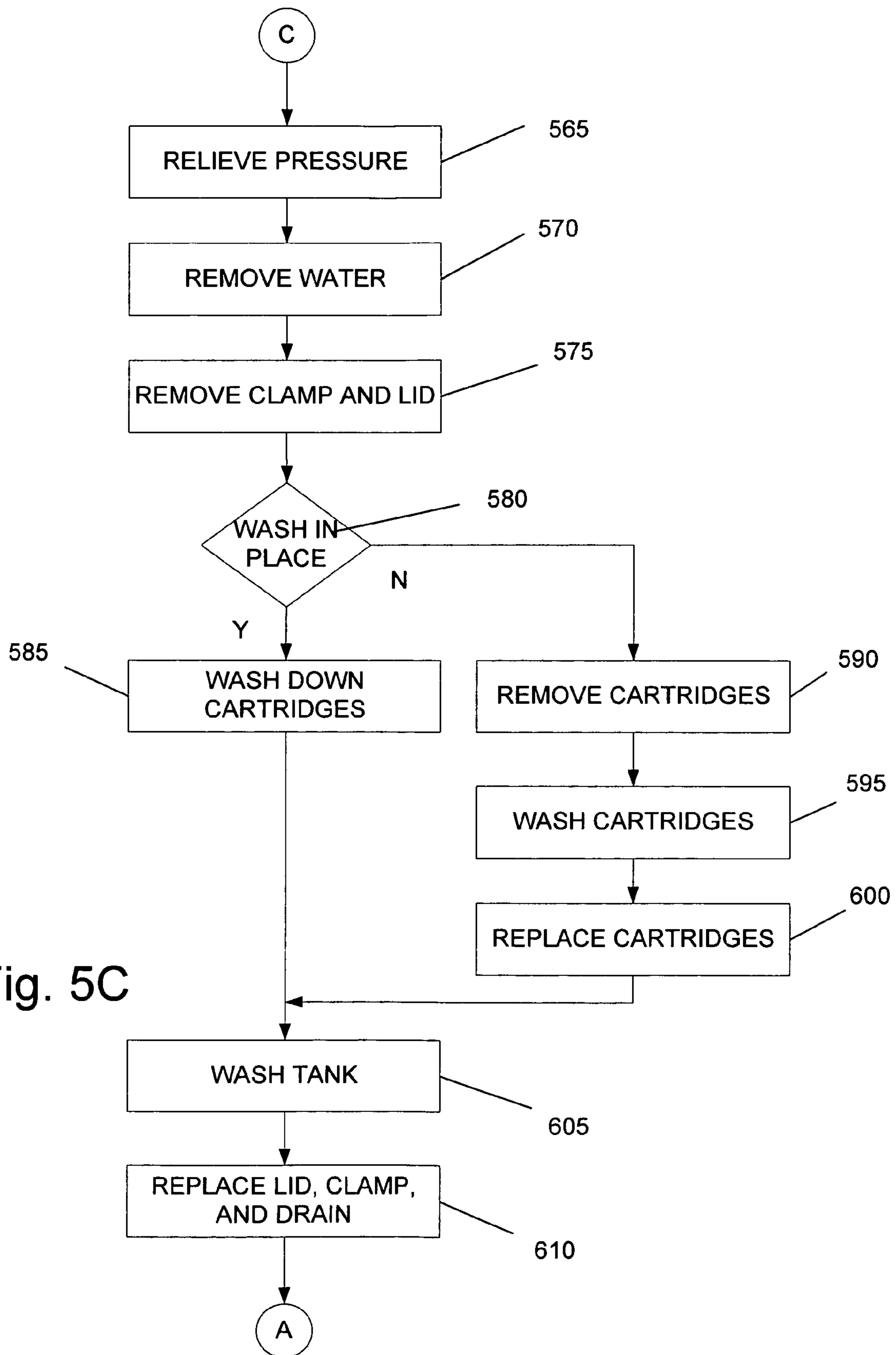


Fig. 5C

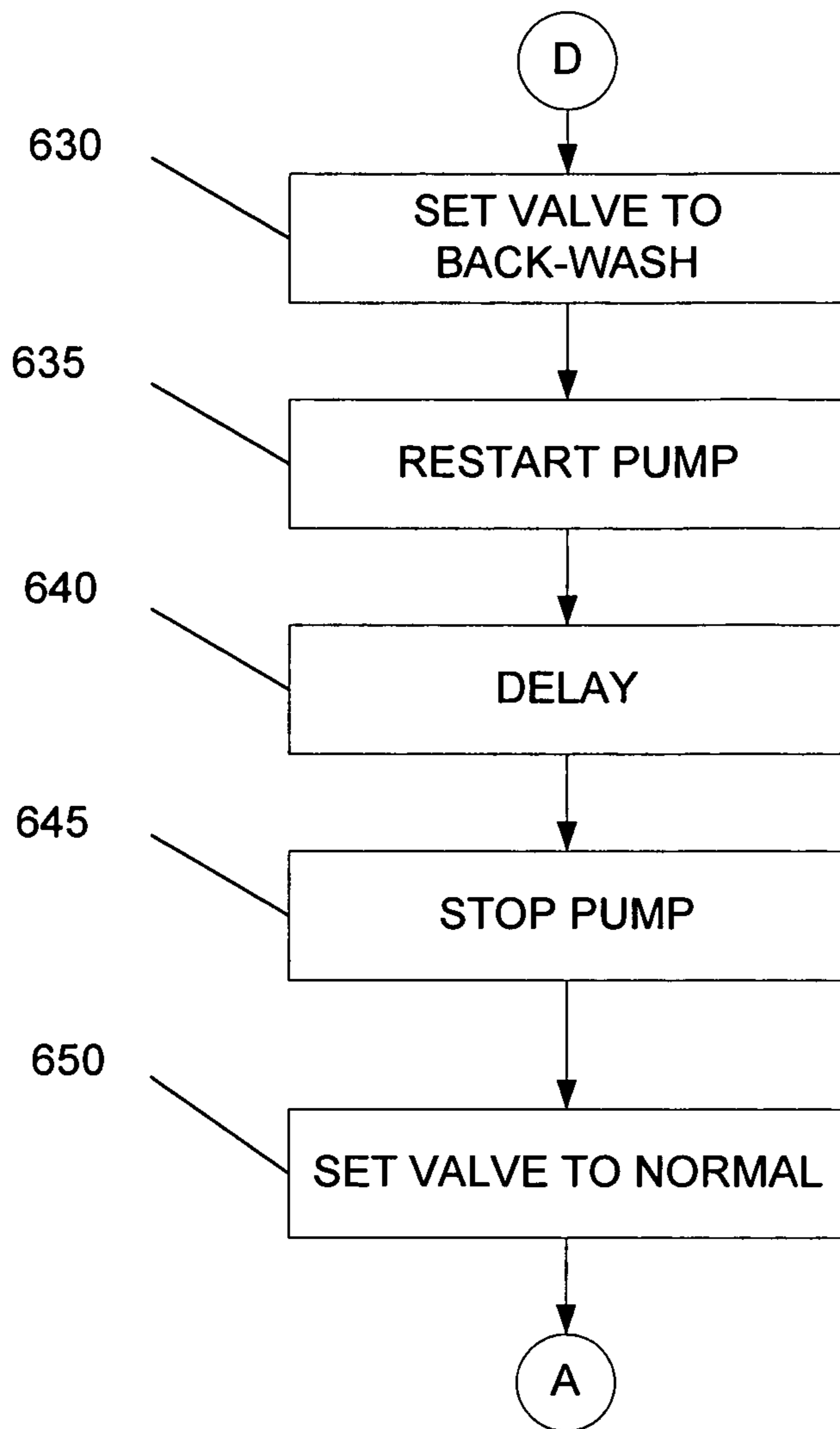


Fig. 5D

## 1

DIATOMACEOUS EARTH FILTER  
APPARATUS AND METHOD

## BACKGROUND

Diatomaceous earth (“DE”) filters are often used to filter the water of swimming pools, spas, water features, etc. DE filters typically include a septum with relatively large pores that DE cannot pass through. Adding a solution of water and DE to the filter can form a cake of DE on the surface of the septum. The addition of the DE to the septum can create a smaller porous structure to improve the filtering capability of the septum. However, contaminants caught in the DE over time can reduce the filtering capability of the septum. As a result, the DE must be removed from the septum and reapplied. Various techniques have been used to remove the DE from the septum. These conventional techniques generally do not remove all the contaminants from the septum, allowing the contaminants to build up and eventually affect the performance of the filter.

## SUMMARY

In one embodiment, the invention provides a method of removing diatomaceous earth and contaminants from a filter. The method can include opening a drain in a bottom tank and removing a lid to expose one or more filter cartridges. The method can also include washing down the filter cartridges to remove the diatomaceous earth and the contaminants from a septum of the filter cartridges. The method can further include washing the diatomaceous earth and the contaminants out of the bottom tank through the drain, replacing the lid, and closing the drain.

Another embodiment of a method of removing diatomaceous earth and contaminants from a filter can include setting a backwash valve to a backwash position to reverse liquid flow. The method can include directing liquid flow from an interior to an exterior of one or more filter cartridges. The method can also include directing liquid flow from a filter interior through a cartridge tube having holes to the exterior through a septum in order to remove the diatomaceous earth and the contaminants from the septum. The method can further include directing liquid flow through a backwash sprayer to create turbulence in a bottom tank and directing liquid flow from the exterior of the filter cartridge and from the bottom tank to a backwash pipe.

Some embodiments of the invention provide a method of filtering contaminants from a liquid using diatomaceous earth. The method can include removing substantially all air from a filter tank, spraying unfiltered liquid into the filter tank to substantially fill the filter tank with liquid, and continuing to spray unfiltered liquid into the filter tank to create turbulence. The method can also include directing the unfiltered liquid from an exterior of one or more filter cartridges through a septum coated with a solution including diatomaceous earth to an interior of the filter cartridges in order to filter the liquid. The method can further include sealing the filtered liquid within the interior of the filter cartridges from the unfiltered liquid and directing the filtered liquid through the filter cartridges to an outlet.

Some embodiments of the invention provide a diatomaceous earth filter for filtering contaminants from liquid. The filter can include one or more filter cartridges each including a septum coated with a solution including diatomaceous earth. The filter cartridges can also include a cartridge tube with holes to increase liquid flow during a backwash process. The filter can also include a backwash sprayer to spray liquid

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during the backwash process in order to disturb contaminants in a bottom portion of a filter tank.

Another embodiment of the invention provides a diatomaceous earth filter including a bottom tank with a drain. The filter also includes one or more filter cartridges at least partially positioned in the bottom tank. The filter cartridges can include a septum coated with a solution including diatomaceous earth. The filter can also include a removable lid positioned over the filter cartridges and a clamp that secures the removable lid to the bottom tank.

Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cut-away perspective view of a DE filter according to one embodiment of the invention.

FIGS. 2A and 2B are exploded views of the DE filter of FIG. 1.

FIG. 3 is a schematic view of a clamp, a lid, a bottom tank, and an o-ring of the DE filter of FIG. 1.

FIG. 4 is a perspective view of a clamp of the DE filter of FIG. 1.

FIGS. 5A-5D are flow charts of processes for operating a DE filter according to embodiments of the invention.

## DETAILED DESCRIPTION

Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of “including,” “comprising,” or “having” and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms “mounted,” “connected,” “supported,” and “coupled” and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, “connected” and “coupled” are not restricted to physical or mechanical connections or couplings.

FIGS. 1, 2A, and 2B illustrate a DE filter 100 according to one embodiment of the invention. As shown in FIG. 1, the DE filter 100 can include an air relief valve 105, a pressure gauge 107, a lid 110, one or more filter cartridges 135, a clamp 145, a bottom tank 170 including a drain 195, and a backwash valve 220. In one embodiment, the lid 110 and the bottom tank 170 can be constructed of chemical-resistant, fiberglass-reinforced polypropylene to withstand pressures created in the DE filter 100. In some embodiments, the DE filter 100 can withstand internal pressures up to about 50 pounds per square inch.

As shown in FIG. 2A, the DE filter 100 can include a compression spring 115, an adapter 120, a top cartridge manifold 125, and an air bleeder tube 130. As shown in FIG. 2B, the DE filter 100 can include one or more cartridge tubes 137, a backwash sprayer 138, a bottom cartridge manifold 140, and o-ring 150, a ring backup 155, a baffle assembly 160, and an outlet pipe 165. As also shown in FIG. 2B, the clamp 145 can include a barrel nut 175, a large inside diameter washer 180, a clamp spring 185, and a small inside diameter washer

190. As further shown in FIG. 2B, the bottom tank 170 can include the drain 195, an inlet adapter 200, an outlet adapter 205, a first o-ring 210, and a second o-ring 215.

As shown in FIG. 2B, the inlet adapter 200 can include threads that can mate with threads of the baffle assembly 160. The first o-ring 210 can have a diameter substantially equal to a diameter of the threads of the inlet adapter 200. The first o-ring 210 can fit over the threads of the inlet adapter 200 and form a water-tight seal between the inlet adapter 200 and the bottom tank 170 when the inlet adapter 200 is coupled to the baffle assembly 160. The baffle assembly 160 can spray unfiltered water into the DE filter 100. As also shown in FIG. 2B, the outlet adapter 205 can include threads that can mate with threads of the outlet pipe 165. The second o-ring 215 can have a diameter substantially equal to a diameter of the threads of the outlet adapter 205. The second o-ring 215 can fit over the threads of the outlet adapter 205 and form a water-tight seal between the outlet adapter 205 and the bottom tank 170 when the outlet adapter 205 is coupled to the outlet pipe 165.

In one embodiment, the inlet adapter 200, the outlet adapter 205, and the drain 195 can each have an internal diameter of at least about two inches to enable sufficient water flow. In general, the high flow design of the DE filter 100 (including the filter cartridges 135) reduces energy costs associated with operating the pump (not shown).

As shown in FIG. 2B, the outlet pipe 165 can include an elbow 250 so that an opening 255 of the outlet pipe 165 can be positioned in a substantially vertical position. The opening 255 can include threads. In some embodiments, the opening 255 can include one or more o-rings and/or can be press-fit to be coupled to the bottom manifold 140.

As also shown in FIG. 2B, the bottom manifold 140 can include arms 257 with filter receivers 260, an air bleeder receiver 265, and an outlet 270. In some embodiments, the outlet 270 of the bottom manifold 140 can include threads that can be coupled to the opening 255 of the outlet pipe 165.

As shown in FIGS. 2A and 2B, the filter cartridges 135 can each include a cartridge tube 137, a top end cap 300, a septum 320, and a bottom end cap 305. The top end caps 300 and the bottom end caps 305 of the filter cartridges 135 can be in fluid communication with an inner side of the septum 320 and can provide a flow path for liquid passing through the septum 320. In one embodiment, the top end caps 300 and/or the bottom end caps 305 can be constructed of urethane.

The cartridge tubes 137, as shown in FIG. 2B, can be positioned inside each one of the filter cartridges 135 and can extend substantially to the top end caps 300. The cartridge tubes 137 can have holes along their length and can be open at both ends. During backwashing of the DE filter 100, the cartridge tubes 137 can deliver a relatively large quantity of water to the top of the filter cartridges 135. The large quantity of water delivered to the top of the cartridge filters 135 can promote better cleaning of the septum 320. The DE and the contaminants can be forced off the top of the septum 320 initially and gravity can cause the water to clean succeeding lower portions of the septum 320 until the septum 320 is substantially entirely clean. In some embodiments, in excess of about 80% of the DE and contaminants can be removed from the septum 320 by using the cartridge tubes 137, versus about 20% of the DE and contaminants being removed without the cartridge tubes 137.

In one embodiment, the septum 320 can be constructed of polypropylene and can have pores about 25 microns to about 50 microns in diameter. The polypropylene material can be relatively heavy, for example, about 8 ounces per square foot. The polypropylene can also have a coefficient of friction low enough to enable removal of the DE and contaminants from

the septum 320. Water can be applied with low pressure to the septum 320. Because of the low coefficient of friction of the septum 320, the low pressure water can quickly remove substantially the entire quantity of DE and contaminants present on septum 320. In addition, the septum 320 can have a corrugated construction and can have a linear length much greater than a circumference of the filter cartridge 135 (e.g., ten linear feet). The corrugated construction can result in a large amount of filtering area in a minimum amount of space.

The filter cartridge 135 can be manufactured in different sizes (e.g., eighteen, twenty-four, and thirty inch heights). The filter cartridges 135 can be manufactured with multiple filtering areas (e.g., fifteen, twenty, and twenty-five square feet). Using multiple filter cartridges 135 in the DE filter 100 can increase the filtering area (e.g., to sixty, eighty, or one-hundred square inches when using four filter cartridges 135). In other embodiments, less than four filter cartridges 135, such as a single filter cartridge 135, can be used for smaller applications.

A larger filtering area can increase the flow rate of water through the DE filter 100. For example, a DE filter 100 with 60 square feet of filtering area can have a maximum flow rate of about 120 gallons per minute or a turn-over capacity of 86,400 gallons every twelve hours. By contrast, a DE filter 100 with 100 square feet of filtering capacity can have a maximum flow rate of 160 gallons per minute and a turn-over capacity of 115,200 gallons every twelve hours. In addition, a larger filtering area can provide more filtering capacity to extend the time period between filter cleanings.

As shown in FIG. 2A, the top manifold 140 can include a plurality of arms 350 extending from a center support 355. The ends of the arms 350 can include cartridge plugs 360. The cartridge plugs 360 can be received by the top end caps 300 of the filter cartridges 135 and can form a water tight seal to prevent water from entering or leaving the filter cartridge 135 via the top end caps 300.

The air bleeder tube 130 can be positioned on the air bleeder receiver 265 of the bottom manifold 140. The air bleeder tube 130 can extend upward to substantially the top of the DE filter 100 and can be supported by the center support 355 of the top manifold 140. During operation, water in the bottom manifold 140 passing by the bottom opening of the bleeder tube 130 can have a Venturi effect on the air bleeder tube 130. The Venturi effect can draw air from the top of the DE filter 100 into the air bleeder tube 130 and force the air out the outlet port 205. During normal operation, substantially no air should be present in the DE filter 100. If substantially no air is present in the DE filter 100, the Venturi effect can draw water from the upper portion of the DE filter 100.

As shown in FIG. 2A, the adapter 120 can fit over the center support 355 of the top manifold 140 and the air bleeder tube 130. The spring 115 can fit over the adapter 120 to bias the adapter 120 and the top manifold 140 downward when the lid 110 is in place. Biasing the top manifold 140 downward can force the plugs 360 of the top manifold 125 into the top end caps 300 to seal the upper portions of the filter cartridges 135 and to prevent water from passing through the top end caps 300.

As also shown in FIG. 2A, in some embodiments, the manual air relief valve 105 can include threads that can mate with threads in an aperture 380 of the lid 110. The manual relief valve 105 can be opened to allow air and/or water in a top portion of the DE filter 100 to escape. During start-up of the DE filter 100, the manual relief valve 105 can be opened (e.g., by turning the valve 105 a quarter-turn counter-clockwise) and can allow any air trapped in the DE filter 100 to escape. Once all the air in the DE filter 100 has escaped, water

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can begin to escape through the manual relief valve **105**, which can generally indicate that substantially all the air in the DE filter **100** has been removed. The manual relief valve **105** can be closed (e.g., by turning the valve **105** a quarter-turn clockwise) enabling pressure to build up in the DE filter **100**. The pressure can force water to flow through the septum **320**, down through the bottom manifold **140**, and out the outlet pipe **165**.

As shown in FIGS. **2B** and **3**, the o-ring **150** can be positioned between the lid **110** and the bottom tank **170** and secured by the clamp **145**. The o-ring **150** can be positioned in a lower groove **390** around an upper edge **395** of the bottom tank **170**. A lower edge **392** of the lid **110** can also include an upper groove **397**. The o-ring **150** can provide a seal between the upper groove **397** of the lid **110** and the lower groove **390** of the bottom tank **170**. As also shown in FIG. **3**, the clamp **145** can be positioned around a flange **400** of the bottom tank **170** and a flange **405** of the lid **110**. A center segment **410** of the clamp **145** can be positioned over the flange **400** of the bottom tank **170** and over the flange **405** of the lid **110**.

FIG. **4** further illustrates the clamp **145**, which can include a T-bolt **425** and a trunnion **430**, in one embodiment. A first end **420** of the T-bolt **425** can mount to the clamp **145** in a hinged configuration and a threaded end **422** can pass through the trunnion **430**. The large inside diameter washer **180**, the spring **185**, and the small inside diameter washer **190** can be positioned on the T-bolt **425**. The large inside diameter washer **180** can be positioned over the T-bolt **425** between the barrel nut **175** and the spring **185**. The barrel nut **175** can be tightened to move the large inside diameter washer **180** toward the spring **185**. The spring **185** can bias the small inside diameter washer **190** toward the trunnion **430**. As the barrel nut **175** is tightened onto the T-bolt **425**, the bias of the spring **185** on the trunnion **430** can force a first end **445** and a second end **450** of the clamp **145** toward one another to tighten the clamp **145** around the lid **110** and bottom tank **170**. Securing the clamp **145** around the DE filter **100** can cause the lid **110** to compress the o-ring **150** toward the bottom tank **170** to create a water tight seal of sufficient strength to withstand the pressure applied to the DE filter **100**.

FIGS. **5A-5D** illustrate processes for operating the DE filter **100** according to embodiments of the invention. The DE filter **100** operates under pressure, and in order for the DE filter **100** to operate correctly, substantially all air must be removed. When starting the DE filter **100**, the air relief valve **105** can be opened (block **500** of FIG. **5A**) by turning the air relief valve **105** a quarter turn counter-clockwise. A drain of a swimming pool can also be closed (block **505**) and can enable a skimmer of the swimming pool to provide water to the DE filter **100**. The pump of the swimming pool, spa, water feature, etc. (not shown) can be started (block **510**). The pump can draw water from a swimming pool skimmer and can force unfiltered water into the inlet adapter **200** and the baffle assembly **160**. The baffle assembly **160** can spray the unfiltered water into the DE filter **100**. During normal operation, when the DE filter **100** is substantially filled with water, the baffle assembly **160** can create turbulence to assist in dispersing the unfiltered water, and thus any contaminants in the water, to facilitate filtering of the water.

As the DE filter **100** fills with water, air in an upper portion of the DE filter **100** can be forced out the air relief valve **105**. Eventually, substantially all of the air in the DE filter **100** can be expelled and water can flow from the air relief valve **105**. An operator can determine (at block **515**) whether a steady stream of water is exiting the air relief valve **105**. If water is not exiting the air relief valve **105**, the operator can determine (block **520**) whether a period of time that should be sufficient

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to fill the DE filter **100** has elapsed (e.g., 30 seconds). If the time period has not elapsed, the operator can continue to monitor the air relief valve (at block **515**). If the time period has elapsed, the operator can shut the pump down (block **525**). If the operator observes (block **515**) a steady stream of water exiting the air relief valve **105**, the DE filter **100** is substantially filled with water and the operator can close the air relief valve **105** (block **527**) (e.g., by turning the air relief valve **105** a quarter turn clockwise).

DE can be added to the DE filter **100** (block **530**). In one embodiment, the septum **320** of the filter cartridges **135** can include pores having openings of about 25 microns to about 50 microns in size. In one embodiment, for example to achieve a level of filtering for a swimming pool, the operator can add DE to the septum **320** to reduce the size of the openings to about one micron to about five microns in order to filter out dirt, algae, and some forms of bacteria. In other words, the DE filter according to one embodiment of the invention can filter substantially all contaminants in excess of about one micron to about five microns from any liquid able to pass through a one micron to five micron opening. A sufficient quantity of DE can be added to substantially coat the surface of the septum **320** (e.g., one pound of DE for every ten square feet of septum **320** area). The DE can be added to water to form a thin, milky mixture and can then be introduced into the DE filter **100**. The mixture can be drawn into the DE filter **100** through the inlet aperture **200** and distributed by the baffle assembly **160** to coat the septum **320** of the filter cartridges **135**.

If this is the first time the DE filter **100** is being run (block **535**), the operator can record (block **540**) the pressure inside the DE filter **100**. If this is not the first time the DE filter **100** is being run (block **535**) (i.e., following a backwash), the operator can check (block **545**) the pressure to ensure that the pressure in the DE filter **100** is within an operating tolerance (e.g., within four to five pounds per square inch of the recorded pressure). If the pressure is not within the operating tolerance, the operator can turn the pump off (block **525**). If the pressure is within the operating tolerance, the DE filter **100** can operate to filter the water in the swimming pool, spa, water feature, etc.

As shown in FIG. **5B**, the operator can periodically check (block **550**) the pressure in the DE filter **100**. When the pressure in the DE filter **100** rises above a threshold (e.g., ten to twelve pounds per square inch above the recorded pressure), the DE filter **100** may require cleaning. The operator can shut off (block **555**) the pump. The operator can determine (block **560**) whether to clean the DE filter **100** by a washing down process or a backwashing process.

FIG. **5C** illustrates a process for washing down the DE filter **100** according to one embodiment of the invention. Before opening the DE filter **100**, the pressure inside the DE filter **100** must be relieved (block **565**). The pressure in the DE filter **100** can be relieved by opening the air relief valve **105** (e.g., by turning the air relief valve **105** a quarter turn counter-clockwise). Water in the DE filter **100** can also be removed (block **570**) by opening the drain **195**. The clamp **145** and the lid **110** can be removed (block **575**). As shown in FIG. **4**, the clamp **145** can be removed by loosening the barrel nut **175**. The barrel nut **175** can be completely removed or just loosened to a point that the clamp **145** can be removed from the DE filter **100**. Once the clamp **145** is removed, the lid **110** can be removed.

With the lid **110** removed, the filter cartridges **135** are exposed. An operator can decide (block **580**) whether to wash the filter cartridges **135** in place or to remove the filter cartridges **135** for washing. Washing in place (block **585**) can be

accomplished by hosing the filter cartridges **135** down to remove the DE caked on the septum **320**, along with any contaminants trapped in the DE. The removed DE and the contaminants can be washed out the drain **195**. Removing and washing (blocks **590** and **595**) the filter cartridges **135** can be accomplished by removing the top manifold **125**, lifting the filter cartridges **135** out of the bottom manifold **140**, and washing each filter cartridge **135** individually. The filter cartridges **135** can then be replaced (block **600**) by placing the filter cartridges **135** into the bottom manifold **140** and placing the top manifold **125** on the filter cartridges **135**.

The bottom tank **170** and the lid **110** can also be washed out (block **605**). After the filter cartridges **135**, the bottom tank **170**, and/or the lid **110** are sufficiently washed out, the lid **110** can be replaced onto the bottom tank **170**, the clamp **145** can be reattached, and the drain **195** can be closed (block **610**). The DE filter **100** can then be restarted by following the process beginning at block **510** of FIG. **5A**.

FIG. **5D** illustrates a process for backwashing the DE filter **100** according to one embodiment of the invention. The backwash valve **220** (as shown in FIG. **1**) can be set (block **630**) to a backwash position and the pump can be restarted (block **635**). The backwash valve **220**, in the backwash position, can reverse the flow of water into the DE filter **100** (i.e., the water can be pumped into the outlet adapter **205** and can flow out of the inlet adapter **200**). The backwash valve **220** can also include a backwash pipe (not shown) that can divert water coming from the DE filter **100** to a drain or sewer so that the contaminated water coming from the DE filter **100** does not flow into the swimming pool. The operator can let the backwash run for a period of time (e.g., ten minutes) (block **640**) to allow the DE caked on the septum **320** and any contaminants contained in the DE to be washed off of the septum **320** and to flow out of the DE filter **100** through the backwash pipe.

The backwash sprayer **138** can be positioned between the air bleeder tube **130** and the air bleeder receiver **265** as shown in FIG. **2B**. During backwashing, the water flowing into the bottom manifold **140** can be forced into the backwash sprayer **138**. The water can exit the backwash sprayer **138** through jets positioned at opposing ends of the backwash sprayer **138**. The backwash sprayer **138** can include a check valve which can prevent water from flowing unfiltered through the jets and into the bottom manifold **140** during normal filtering. In some embodiments, the backwash sprayer **138** can be stationary. In other embodiments, the force of the water exiting the jets can cause the backwash sprayer **138** to rotate. The water exiting the jets of the backwash sprayer **138** can create turbulence in the bottom tank **170**. The turbulence in the bottom tank **170** can cause contaminants that have settled into the bottom tank **170** to become suspended in the water. The suspended contaminants can then be flushed out the backwash pipe. The turbulence caused by the backwash sprayer **138** can remove significantly greater contaminants from the DE filter **100** during backwashing and can result in a longer time period before another backwashing is required. As shown in FIG. **5D**, the operator can then stop the pump (block **645**). The backwash valve **220** can be reset (block **650**) to a normal operating position. The operator continues at block **510** by restarting the DE filter **100**, as shown in FIG. **5A**.

The backwash sprayer **138** can have any structure capable of generating turbulence in the bottom tank **170**. Embodiments of backwash sprayers can include jets on a bottom side

of the bottom manifold **140**, a plurality of pulsating jets, a plurality of stationary jets, a plurality of rotating jets, a plurality of jets cycling forward and backward, one or more hoses having a free moving outlet positioned in the bottom tank **170**, a rotating or stationary circular head having a plurality of jets, and one or more rotating arms having one or more jets.

In some embodiments, a backwash brush or scraper can be positioned in the bottom tank and can have jets to rotate the backwash brush or scraper during a backwash.

In some embodiments, a backwash sprayer can be coupled to the outlet pipe **165**. In other embodiments, a backwash sprayer can be coupled to the bottom manifold **140**. Some embodiments can include more than one backwash sprayer and/or can include a plurality of backwash sprayers coupled to the outlet pipe **165**, the bottom manifold **140**, and/or the air bleeder tube **130**.

Various features and advantages of the invention are set forth in the following claims.

The invention claimed is:

**1.** A diatomaceous earth filter for filtering contaminants from liquid, the filter comprising:

a top cartridge manifold;

a bottom cartridge manifold;

at least one filter cartridge coupled to the top cartridge manifold and the bottom cartridge manifold, the at least one filter cartridge including a septum coated with a solution including diatomaceous earth, the at least one filter cartridge including a cartridge tube with a plurality of holes to increase a quantity of liquid flow to the top of the filter cartridge during a backwash process,

the at least one filter cartridge and the cartridge tube coupled between the top cartridge manifold and the bottom cartridge manifold, the cartridge tube delivering liquid from the bottom cartridge manifold upward toward the top cartridge manifold during the backwash process, the top cartridge manifold being sealed against the at least one filter cartridge in order to prevent liquid from leaving the filter cartridge via the top of the filter cartridge during the backwash process and to force liquid outward through the septum during the backwash process; and

a backwash sprayer to spray liquid during the backwash process, the backwash sprayer positioned outside of the at least one filter cartridge in order to disturb contaminants that have settled in a bottom portion of a filter tank, the backwash sprayer rotatably coupled to the bottom cartridge manifold so that water flowing through the bottom cartridge manifold during the backwash process is forced into the backwash sprayer and through jets of the backwash sprayer.

**2.** The filter of claim **1** wherein the backwash sprayer rotates while spraying liquid during the backwash process.

**3.** The filter of claim **1** wherein the backwash sprayer creates turbulence to disturb contaminants that have settled in the bottom of the filter tank.

**4.** The filter of claim **3** wherein the disturbed contaminants are suspended in the liquid and removed from the filter tank through a backwash pipe.

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